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Teaching Big. Educational strategies in the field of data journalism – a comparative study in five European countries

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Educational strategies in data journalism – a comparative study in six European countries

Abstract

The article explores training programs in higher education with regard to data journalism from a multi-national perspective. By carrying out a comparative analysis in six European countries (Germany, Switzerland, the Netherlands, Italy, Poland, and the UK), it covers different models of media systems and journalistic cultures envisaged by Hallin and Mancini (2004). Based on a desk review and in-depth interviews with instructors of data journalism in each country, the article identifies different approaches to the way data journalism is taught. In Europe, such programs are offered by four types of organizations: academic, vocational, professional, and civic. The role played by those organizations can be explained as a result of the peculiarities of national media systems. But there are also commonalities, e.g. non-academic institutions (such as the European Journalism Center or the Center for Investigative Journalism) and major international news outlets (such as *The Guardian* and *The New York Times*) seem to take over a leading role in all of the analyzed countries. Generally speaking, data journalism education appears to be a very young discipline that frequently neglects fundamental journalistic topics such as ethical issues, transparency, accountability and responsiveness, although they are crucial in a journalistic field as sophisticated tools to reveal hidden aspects of reality.

Keywords: open data, Foia, data journalism, education, journalism culture, transparency

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Introduction: data and journalism

Data journalism is a popular term. There is a growing community of professional journalists, startup entrepreneurs and educators with a joint interest in exploring the journalistic potential of working with large datasets. An increasing number of journalistic projects involving large amounts of data and breath-taking visualizations gain international attention, especially those from international quality news media such as *The New York Times* and *The Guardian*. 'The War Logs' (concerning WikiLeaks files on US military's logs of the Afghan conflict between January 2004 and December 2009) or 'Investigate your MP's expenses' (a crowdsourcing project concerning hundreds of thousands of documents on expenses of members of the UK parliament) grew out to be exemplary projects of data journalism. Besides these major examples, data journalism is also being adopted in smaller newsrooms, such as those of the Swiss daily *Neue Zürcher Zeitung*, the US *South Florida Sun Sentinel*, or the Ukrainian *Texty*.
Having roots in computer-assisted reporting (CAR) and the social scientific elements of 'precision journalism' as coined by Philip Meyer (2002), data journalism is a matter of collecting, processing, analyzing and presenting big amounts of information by using computer technology. Although the term is largely used, due to its origin[1] and the variety of the practices it includes, it is difficult to provide a clear-cut definition or to suppose that it refers to similar practices and representations.
The emergence of data journalism is related at least at three features: firstly, technological development and ongoing digitalization (DeFleur, 1997; Gray et al., 2012). Secondly, market forces play a crucial role too: as the news media compete fiercely for news users' attention, they may find business models in data journalism through providing premium access to attractive visualizations or offering data analyzing services for other companies (Aitamurto, 2011). Finally, the openness of the government and its permeability to news outlets is a determinant for its diffusion. Data journalism is also intertwined with the government provision of open data as a sign of open society and transparency (Lathrop and Ruma, 2010). Although, when it comes to the pursuit of openness and transparency, some tensions remain between journalism and public bodies (Cohen, 2011), a stronger focus on open policies and transparency from public bodies could definitely be an essential trigger to foster investigative and accountability-related reporting, including data journalism (Bowles et al., 2014).
If technological, commercial and governmental forces explain the context that can nourish data journalism and its impact, its emergence and the forms it would potentially acquire should be contextualized to journalistic professional cultures. Generally, journalists believe

that fact-checking, following up on different sources and verifying information are what distinguishes them from other people working in the publishing sector (see Fenton and Witschge, 2010). Therefore, as for an increasing number of practices within contemporary (digital) journalism, the difference between general data analysis and data *journalism* is and should be placed within professional values. This means that to define its borders, it is fundamentally essential to examine the way in which it is taught and will be absorbed by the profession and its practitioners. Journalists define data journalism usually with more emphasis on journalism professionalism than data analysis (see Lorenz 2011; Bradshaw in Gray *et al.* 2012, 2).

Besides a steady stream of practical publications on data journalism (e.g. Gray, Bounegru & Chambers, 2012; Lorenz, 2011; Nguyen 2010; EJC, 2014), the interest in data journalism is also mirrored by an increasing amount of academic literature, although this is often driven by the lens of big data (see Lewis, 2014). Up to now, three major strands of research are discernible (Fink and Anderson, 2014: 14). The first focuses on journalistic actors and their professional production processes, often discussing practical issues of everyday newsroom work and highlighting notable strategies in dealing with data (Flew et al., 2010; Nguyen, 2010). The second area of research is marked by a particular interest in the infrastructures of data journalism by analyzing the organizational parameters in notable newsrooms such as *The New York Times* (Royal, 2010) or in the Chicago area (Parasie and Dagiral, 2012) or in specific cases, such as the publication of the WikiLeaks revelations concerning the war in Afghanistan (Baack, 2011). The third group of studies tries to historicize current trends in data journalism and looks for analogies in comparison to older patterns of data-oriented newswork (Powers, 2012; Parasie, 2014).

These studies indicate and confirm that although data journalism is largely technology-driven, professionals working in this area commonly keep a normative consideration of journalism serving the public good. Moreover, as Parasie and Dagiral (2012) stress, the integration in the newsroom of 'programmer-journalists' – with their involvement in open source communities and open government advocacy – has conveyed epistemological propositions that have been controversial in the journalism community. As such, data journalism is a challenge to journalistic principles with moral claims of programmers – i.e. seeing news as structured information instead of 'stories hidden in the data', designing research tools for the audience instead of one-way communication, and increasing independent news-making instead of relying on government agendas and existing data sets. Among journalists there is a need to train their statistics and calculation skills as well as their ability to play a leading role in

teamwork with programmers and designers. However, except for a few contributions (see Davenport et al., 2002; Yarnall et al., 2008), even the most complete review of data journalism literature lacks a systematic analysis of educational strategies in the field.

Additionally, most analytical perspectives on data journalism so far are limited to specific geographical areas – be it the media landscape of a city (Parasie and Dagiral, 2012) or of one country (Appelgren and Nygren, 2014; Karlsen and Stavelin, 2014). This has its weaknesses, with most existing research on data journalism tending to neglect the context factors that shape the development of the field. Assuming that local or national characteristics affect the way data journalism evolves, many authors suggest extending research to a broader international comparative perspective. As Aitamurto et al. (2011) have pointed out, governments live up to the standards of open data and freedom of information differently, which might explain international differences in the state of the art of data journalism. According to the 2015 Open Data Barometer Ranking[2], for instance, strong discrepancies are visible between European countries which rank unevenly between the 1st (UK) and the 55th (Ukraine) position. Similarly, Fink and Anderson (2014) argue for the need to study data journalism at the inter-institutional and cross-cultural level, in order to come to a broader understanding of current developments in the field, instead of focusing on the 'usual suspects'.

This article intends to tackle the prevalent research deficit by analyzing the state of the art of data journalism education from an international comparative perspective. How is data journalism being taught in the various journalism cultures in Europe? What kinds of programs, which skills and topics are presented? How can we characterize the educators and their backgrounds? And in what ways do contextual factors explain the characteristics of different training programs?

Research design

The above questions will be answered on the basis of a two-step empirical research design for each participating country which included a) systematic desk studies to describe existing curricula and courses and b) in-depth interviews with 16 data journalism educators, conducted between January and June 2014.[3] The interviewees were selected on the grounds of two different variables: their expertise (how long they have been working and/or teaching as a data journalist), and, whether the institution they are working for is active in and known for data journalism education.

The two steps have to be understood as integrated: the in-depth interviews helped to clarify the map of data journalism education, which in turn helped to indicate whom to interview. At the very beginning, the desk study identified courses by websites, starting with the most well-known schools of journalism, followed up by search engine through key terms (particularly computational, data and algorithmic journalism). Data journalism education was defined as the teaching of *newsmaking* made by data (including all stages of the production: processing, collecting, analyzing and visualizing data), whether it is offered by civil servants teaching journalists how to use their data or as formal courses at universities. We therefore included universities, j-schools, vocational schools, together with conferences, workshops and online courses offered by NGOs, associations and other organizations. We concentrated on six European countries in our analysis: Italy, Germany, the Netherlands, Poland, Switzerland, and the United Kingdom. These countries were selected in order to represent different types of journalism cultures, according to the heuristic model by Hallin and Mancini (2004) who differentiate between liberal, democratic-corporatist and polarized-pluralist media systems in the Western world. By applying a most-different systems design to our research project, we hope to come to conclusions about our research object that are not limited to single geographical regions, but offer universally valid insights instead.

Data journalism education in Europe

For an overview, the results from our desk analysis show that data journalism in Europe is offered by four types of organizations: academic, vocational, professional, and civic. Some examples of these providers are presented in Table 1.

	D	NL	UK	CH	PL	I

Academic	TU Dortmund Macromedia Hochschule für Medien und Kommunikation Universität Bamberg, Hochschule Magdeburg	Tilburg University (15) Groningen University, University of Amsterdam (2); Leiden University (1); Utrecht University (1)	City University in London Cardiff University Birmingham City University University of London	University of Zürich	Strzeminski Academy of Art Maria Curie-Skłodowska University (Lublin)	University of Bologna International School of Advanced Studies (Trieste)
Vocational	Berliner Journalismschule (2); Leipzig School of Media	Fontys School of Journalism Utrecht School of Journalism; Windesheim School of Journalism	Centre for Investigative Journalism	MAZ – Die Schweizer Journalistenschule Centre de Formation au Journalisme et au Médias (Lausanne)	N.A.	Perugia International Journalism Festival
Professional	Medienakademie of the broadcaster ARD/ZDF Nachwuchsjournalisten in Bayern e.V. Journalisten-Training B. Oswald	NJV Academy European Journalism Centre; *Groene Amsterdammer* and others	Online webminars BBC Academy Journalism.co.uk webinars	N.A.	Media Lab Katowice (Urban Data Stories) *Gazeta Wyborcza* and *Press* with Google	N.A.
Civic	N.A.	N.A.	N.A.	N.A.	EuroHack (Open Government Data Camp); e-learning on the DataBlog.pl	Associazione OpenPolis and Associazione giornalismo investigative Fondazione Ahref OpenCoesione

Table 1: Examples of data journalism courses in Europe

Looking at the available courses in the analyzed countries, the development status of data journalism teaching looks promising, but still not exceptional. When it comes to academic teaching, the Netherlands, Germany and the United Kingdom are the countries where university data journalism teaching is more flourishing. Italy and Poland follow, but Polish journalists and students in particular can benefit from a wide range of non-academic courses.

The provision in Italy seems to be scarcer and less structured, while Switzerland, despite its own small market and population, offers a reasonable number of options.

Institutionalization and structure of data journalism education. In order to gain more specific insights into the practical level of what is being taught when it comes to data journalism, we asked the interviewees how these courses had been established over the years, how they are structured, their aims and the main subjects. First of all, we could observe that the educational system with regard to journalism is a decisive factor when it comes to the establishment and diffusion of data journalism courses, as presented in Table 1. This falls in line with what Hallin and Mancini (2004: 296) claimed about the 'development of journalistic professionalism' to be one of the main factors to shape the media ecosystem. The educational programs in a given country do not only cultivate and reproduce professional standards and influence the journalistic culture. At the same time, the educational system is also an expression of the media system as well as the political and economic context. If education in the area of journalism is more institutionalized, so is the provision of data journalism education and eventually the background of the educators. Where educational programs are rare or under construction, innovative journalism practices are seldom taught and the backgrounds of the educators are more heterogeneous. In the UK educators often have an academic background and courses are taught in the most prevailing journalism schools. Conversely, in Italy there are different data journalism courses but they have unpredictable trajectories: some are offered by a state department that provides open data and teaches how to use them; others by journalists who have learnt and brought data journalism from abroad. Something similar happens in Poland. In such environments, the novelty is that there is more of a bottom-up strategy, particularly in new and innovative areas such as data journalism education (Papathanassopoulos, 2009).

In liberal countries such as the UK, journalistic education has been available in institutions of higher education since the 1970s, with the result that nowadays four out of five journalists are graduates – even if the classic on-the-job training is still popular (Bromley, 2009). The same applies to data journalism education. We could observe from our interview data that in the UK, most courses are held at universities, particularly for upcoming journalists or journalism students. However, also vocational institutions such as the Centre for Investigative Journalism or the Guardian offer training in data journalism, particularly in the course of professional development. In other highly professionalized countries such as Germany, the Netherlands or

Switzerland, the educational framework is similar, even if programs are not exclusively bound to the system of higher education (Weibull, 2009). Some courses are offered at universities – such as the Master in Data Journalism at the University of Tilburg or the BA/MA program in Science Journalism with a focus on data journalism at Dortmund University of Technology or the courses offered at the University of Zürich – while others take place at private institutions such as the Medienausbildungszentrum MAZ in Lucerne (Switzerland) or as stand-alone workshops offered by freelance trainers.

Besides the structure of education in a given country, the interviews showed that there is also an economic aspect to it: universities have to be attractive as there is a high competition among those that offer full journalism BA degrees. This is particularly the case in the UK, Germany, the Netherlands and Switzerland. In countries with lower competition like Italy or Poland, such courses are not part of the curricula. In those countries, journalists or individuals interested in data journalism have to look out actively for courses and these courses are not even accepted by the journalist's association, which is in itself another disincentive for the development of data journalism education and training provision. This market factor depends also on the employability of (future) data journalists. If the media industry is able to absorb numerous data journalists, the educational system has to follow suit and train the students – often bringing together different subjects such as journalism and informatics, computing or communication design. Regional and local papers have started to invest in data journalism as well. Hence, there is a persistent request for skills such as data handling and analysis. In other countries – not only Eastern or Mediterranean Europe, but also in highly professionalized countries like Switzerland – fully fledged data journalists only slowly enter the market, because not all media organizations are actively seeking to hire them. In Italy, for instance, few niches for data journalism exist. They breed freelancers that can occasionally offer their work to newsrooms that do not have a data journalism department. In the UK, future data journalists (especially investigative journalists) may find their way into existing data journalism departments of big media companies.

Social aspects such as the existence of a Freedom of Information Act (FOIA) are vital in order to have access to public data and therefore nourishing data journalism. Most of the regulations operating in the countries analyzed for this research have come into existence during the late 1990s or at the beginning of the 2000s and can be considered as efficient: UK received 99 points (out of 150) in the Global Right to Information Rating (RTI)[4], the Netherlands 83 and Switzerland 77. Where there is no FOIA or a similar regulation, such as in Italy or Poland, which obtained only 57 and 62 respectively in the RTI Rating, it is quite hard to gather public

data about the operations of public bodies. Even in Italy, where similar regulations with regard to public transparency exist, the government and the administration slowly respond to the requests, which is why data journalism training in the country focuses a lot on data gathering.

The content of the courses. There are two key areas by which the content of data journalism curricula can be analyzed: 1) practical versus theoretical contents, and 2) statistical and mathematical skills versus journalistic skills.

With regard to the *practical vs theoretical perspective* we could observe that there are differences between higher education courses and training programs by other stakeholders. Whereas university-based courses focus on a much more holistic approach to data journalism – they include for instance the history of data journalism – training programs offered by media companies and other private institutions focus much more on practical skills such as data gathering, elaboration, analysis and presentation. Courses by the latter strongly focus on software and techniques of data journalism. As an Italian expert explained, they try 'to teach students to prepare and write an online data journalism article. Students have to learn how to find a story, identify the needed data, download them, work on them, prepare them and write the story'. One of the Swiss experts agrees, acknowledging his course to be a practical one, where he teaches how to use Excel and other data journalism software, especially those utilized to visualize data, such as Datawrapper. Ultimately most courses, according to an interviewed Swiss teacher, 'try to develop a data journalist's mindset', that is to let journalists think in terms of data and thus not only from an editorial point of view. In this regard, there are no differences between the countries in the sample, but it is rather a distinction between educational institutions. Most of the analyzed programs teach data journalism actively in their classes, and usually students have to produce a final project or a work of data journalism. However, online self-study plays a major role when it comes to online-based offerings like datajournalismcourse.net.

When it comes to the weighting of *statistical/mathematical and journalistic skills*, the situation is similar: in longer courses, particularly at the higher education level, the focus is on statistical and mathematical topics, whereas shorter courses or workshops try to combine statistical and editorial skills, given that they can just give a condensed insight. Generally, the shorter the course the more prominent the journalistic perspective becomes – also because it is easier for the students (mostly working journalists) to adapt and understand the concepts. On

the other hand, at universities, most students learn statistics and can thus be taught how to use certain methods of analysis and visualize them accordingly.

Teachers of data journalism and their background. Regarding the background of those teaching data journalism, one particular career path seems to emerge: most of the interviewees became acquainted with data journalism in higher education – very often by researching data journalism – before going into journalism, where they become experts in the field. At that point, the interviewees are often invited by higher education organisations (such as the TU Dortmund) or private institutions (such as Medienausbildungszentrum MAZ) to teach students or young journalists. It is therefore not surprising that at universities, there was a high "conversion rate" from former students to teachers/lecturers. However, this career path is mostly limited to countries with a high level of professionalism or where journalism training is offered in higher education. Where data journalism is not yet fully included at university level, educators who already work there – or when they have already an academic background – yearn for proposing such courses. As one of our Polish interviewees declared: 'The idea of running data journalism courses at my university came to my mind in about 2009, as a result of my academic experience as well as my engagement in initiatives like Instytut Kultury Cyfrowej and other NGOs related to the Polish Media Lab[5]. Negotiations with my Faculty management took some time and finally my course started from 2013-2014.'

In countries such as Italy or Poland the teachers' backgrounds are slightly different because they cannot rely on a previously established educational framework. In these countries data journalism training typically grounds on personal interest, because very often there are no teaching materials in the corresponding language and the courses have to be prepared and established from scratch. However, frequently these people acquaint themselves with data journalism initiatives in other countries – including benchmarks such as *ProPublica* or *the New York Times* – or through workshops offered by professional bodies such as the European Journalism Center or the Center for Investigative Journalism.

Educators in data journalism do not necessarily have a media related background. In our sample 10 out of 16 do not have such background. Some started their career in different areas such as political science, pedagogy and international law or even agriculture or microbiology. Some of the interviewees also worked in NGOs or public administration like the City of Katowice, the London Borough of Ealing or the Italian Government. Because of their different backgrounds, some of the teachers began a further education by enrolling in media-related courses such as journalism, media or communication studies. One Swiss instructor, for

instance, started his career as teacher in a primary school, before attending a private J-school and a Master in New Media to move into journalism.

Overall, the analysis of teachers' backgrounds shows that the heterogeneity of the educational offerings in data journalism corresponds to the diverseness in structure and content of the programs. The course profile is thus shaped by the previous experience of teachers – similarly to how the interviewees themselves have been influenced by others, often American experts, in their first contact with data journalism. The specific journalistic part of the content offered by the curricula is deeply intertwined with the educators' backgrounds. Those teachers originating from other educational backgrounds than journalism seem more likely to exclude complex topics such as ethics, transparency or accountability in data journalism, because they want to concentrate on the core aspects of data journalism such as data collection, analysis and visualization. This is apparent through reading the various syllabi we have analyzed, as well as from our interviewees' words. This negligence of ethics in data journalism education is due first to time restrictions (mentioned in our UK, Swiss and Italian cases) but might also be because practitioners often do not have the necessary skills and knowledge to discuss such issues or regard those issues as belonging to the wider journalistic field.

Common features of the curricula. Besides differences between countries in the length and orientation of data journalism courses across Europe, we found some common traits:

- The course structure is very similar, with a focus on how to *collect* data (both research and building up databases), *analyze* data (statistically) and, finally, *present* data (in terms of both visualization and description).
- Two major media outlets are often mentioned as the best examples of data journalism: *The New York Times* and *The Guardian*. Every course shows or uses examples from these two.
- Some established, primarily non-academic, institutions at a European level – especially the European Journalism Center or the Center for Investigative Journalism – take the leading role in data journalism education and training. While the former offers free online courses and materials, the latter brings together European and American experts and becomes a leading training center not only for British journalists.
- A lot of didactic material is available online. This is due not only to fact that data journalism is a net-affine subject, but also because many teachers are particularly keen to share what they do. Some popular online resources include the *Handbook of Data*

Journalism[6], the data-driven journalism website[7] or the Tow Center for Digital Journalism[8]. Big players such as *The Guardian* also regularly publish useful material on data journalism, including its history.[9]

- Generally news organizations do not offer training in data journalism; they rather hire experts. In countries like Switzerland, Italy and the UK, however, there are exceptions to this rule, with a few news firms offering courses in data journalism as part of their in-house professional development programs.[10]
- Most of our interviewees declare that their courses do *not* deal with *big data.* The term "big data", albeit no clear definition is given, describes massive amounts of data that seem to be too big and too complex to be handled by single journalists. The reason is not just a matter of elaboration, but even of gathering. In the words of one of our Italian data educator: 'If Google, Facebook and other major media companies work with a box of rice, we work with five or six grains. There are not databases as such available for journalists and we would need more computing capacity anyway'.

Conclusions

Current developments in data journalism prompt an increasing need among journalists – and their teachers – for new knowledge and skills. Therefore, this study – based on desk research of curricula and in-depth interviews with educators – aimed at describing the state of the art of the current provision of data journalism education in Europe. Assuming that international differences in educational systems, market forces and openness of governments could be reflected in data journalism education, we analyzed countries with different media systems (see Hallin and Mancini, 2004).

When it comes to the question how data journalism is being taught in different journalistic cultures in Europe, we found significant differences that can be explained as a result of the peculiarities of national media systems. In some countries data journalism training is still in an 'embryonic state', while in others with a higher level of professionalism, plenty of courses are offered. In Germany, the Netherlands and the UK, data journalism education is relatively widely provided for students in both academic and vocational curricula. In these countries, professional institutions (i.e. media companies, unions and associations) are also relatively strongly involved in offering short term on-the-job training, workshops and conferences.

Two countries with a more modest provision of data journalism education, Poland and Italy, are characterized by a more lively civic or grassroots approach to training data journalism.

Where professional institutions such as the Italian Association of Journalists do not recognize any of the offered courses, alternative organizations seem to fill the gap. In Table 2 we tentatively accentuate the type of education that is provided in the investigated countries.

	D	NL	UK	CH	PL	I
Academic	++	++	++	+	+	+
Vocational	++	++	++	+	-	-
Professional	++	++	++	-	+	+
Civic	-	-	-	-	++	++
Legend: '++' means widespread (several examples); '+' means rare (1-2 examples); '-' nonexistent.						

Table 2: Accents of types of data journalism education in Europe

We do not suggest that the North-West European countries have no grassroots initiatives in data journalism education. In fact there are various examples, but the main accent lies on academic, vocational and professional training. Taking into account the small market and population of Switzerland, the country logically provides only few courses and training.

Despite country differences, we also found similarities. Data journalism is starting to enter the journalistic ecosystem, mainly through some early adopters. The early adopters are usually (but not always) leading print or broadcasting media organisations. This means that a kind of bandwagon or imitation effect is likely to occur in the near future, supporting the diffusion of these innovative forms of journalistic practices. In the UK, for instance, the fact that since 2012 and for the third year in a row, local and regional British newsrooms have won the international Data Journalism Award, is an appropriate indicator for this bandwagon effect (because not only bigger media such as *the Guardian* and the BBC are winning these prizes). This industrial herding behavior can also be observed at an international level, as many media outlets try to emulate leading global brands (mostly from Anglo-Saxon countries, which still have a lead on the rest of Europe). Both processes can in turn support the development of new initiatives and, at the same time, reinforce existing educational initiatives. Nonetheless, data journalism education is still in an experimental stage and no (financially) sustainable model exists. It still represents a very young discipline that lacks certain (qualitative) standards (Stimler Morris, 2014) and neglects fundamental journalistic topics such as ethical issues,

transparency, accountability and responsiveness, although these are particularly crucial in a journalistic field as sophisticated tools to reveal hidden aspects of reality.

Specialised groups of data analysts or data journalists, such as the teams working for the *Guardian*, *Times*, *Telegraph*, *New York Times* or the Dutch *RTL News Facts*, are not yet a common practice – not to mention fully integrated data journalism departments in newsrooms that might coordinate their work with informatics or designers. Most media companies see data journalism as a cost rather than an investment. Although some experimenting newsrooms have produced with some of the most renowned examples of data journalism, the majority of media companies remain hesitant towards investing in data journalism. In addition to financial issues, as some interviewees observed, problems can be related to contextual factors: for example, there is a lack of a 'data journalism' or 'open journalism' philosophy because there are still big issues with access to public information (even though all observed countries have a Freedom of Information Act or similar policies). All this may constitute a disincentive for educational initiatives in the field of data journalism. However, this study shows that educational institutions – academic, vocational and professional – increasingly embrace data journalism.

This is also reflected when it comes to the question about the trainers' backgrounds: in more professionalized countries teachers tend to have some higher education in journalism or communication subjects, while those in countries with a lower degree of professionalization are likely to come from heterogeneous backgrounds. Also, North-western countries tend to offer more structured and collaborative programs between journalism and informatics or computing in order to *bring together* people with different backgrounds and to reduce somehow the emerging competition between different disciplines related to data journalism – a goal which is very hard to reach when it comes to countries with a grassroots approach.

The establishment of data journalism training within higher education should allow future data journalists to acquire knowledge, train their skills and eventually develop self-reflective capacities in order to engage with the public and to be held accountable for their data journalistic work. Future research should monitor whether issues of transparency (also linked to the different national FOIA), accountability and journalism ethics are part of the data journalism education or whether they continue to be neglected. Moreover, a closer and more quantitative look at the background of data journalism educators in different journalism cultures would be essential in order to gain a more detailed overview of the skills and subjects brought into the specific educational programs. Finally, on the ground of this study's exploratory results, it would be necessary to shed light on the institutionalization process of

data journalism, not only when it comes to formal education (e.g. at universities), but also in reference to media organizations: how is data journalism introduced in newsrooms and how is it positioned within the different departments? This will bear crucial implications for data journalism education itself.

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[1] Journalists' work with data sets is a common practice in investigative journalism. Data journalism exists since the early 1800s: in 1821, for example, *The Guardian* published the findings of an investigation on public schools in Manchester with regard to the prices paid for public schooling.

[2] http://barometer.opendataresearch.org/report/analysis/rankings.html (accessed 21 January 2015)

[3] The interviewees were affiliated with a large variety of different institutions, such as the association *Observa, Science in Society*, the Italian version of *Wired*, the Social Cohesion Department of the Italian Government (Italy), the communications agency *Formicablu* (Italy), the *German Federations of Journalists* (DJV), Dortmund University of Technology (Germany), University of Tilburg/Fontys University of Applied Sciences and the start-up media company *LocalFocus* (Netherlands), *Media Lab Katowice*, the Polish *Datablog*, Maria Curie-Sklodowska University in Lublin (Poland), University of Zurich, the MAZ journalism school in Lucerne (Switzerland), City University London, and University of Lincoln (United Kingdom).

[4] http://www.rti-rating.org/country_rating.php (accessed 28 September 2014)

[5] In the new technology field *Media Lab* supports projects which combine creative activities, research and education. The first Media Lab was established at MIT in early 80s (http://www.media.mit.edu/about/mission-history - accessed 22 March 2015). Now it is spreading its activities also in Poland.

[6] http://datajournalismhandbook.org/ (accessed 28 September 2014)

[7] http://datadrivenjournalism.net/about (accessed 28 September 2014)

[8] http://towcenter.org/the-art-and-science-of-data-driven-journalism-history/ (accessed 28 September 2014)

[9] http://www.theguardian.com/news/datablog/video/2013/apr/04/history-of-data-journalism-video (accessed 28 September 2014)

[10] See for instance the La Stampa Academy in Italy (http://www.lastampa.it/medialab/webdoc/la-stampa-academy) or the Guardian Masterclasses (http://www.theguardian.com/guardian-masterclasses/data-visualization-courses?INTCMP=mic_231233) (accessed 28 September 2014).